

# THE INTRINSIC VALUE OF OWNER-OCCUPIED HOUSING

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## ABSTRACT

Residential real estate is commonly valued by using “comps,” the prices for recent transactions of comparable homes. A very different way to value houses is by determining the present value of the anticipated cash flow—the rental cost of living in the home, net of the expenses associated with home ownership. The calculations are complicated because a house is typically financed with a mortgage and this leverage matters if the mortgage rate is not equal to the buyer’s required rate of return. We show how to use a spreadsheet to handle this complex cash flow and apply our model to two different real estate markets, one in which houses seem an attractive investment and one in which prices seem to have risen far beyond intrinsic values.

## Speculative Fuel

People may use comps because they believe a house is a foolproof investment. A superficial justification is an appeal to the laws of supply and demand. Thus the advice of humorist Will Rogers is cited: “Don’t wait to buy land, buy land and wait, the good Lord ain’t makin’ any more of it.” The same argument could be made about anything with a fixed supply, many of which would not be considered seriously as investments: rocks, Chrysler New Yorkers, last year’s clothing fashions. Some people assume that housing prices will increase in the future as they have in the past. Such incautious extrapolation is the Greater Fool Theory: Buy something at an inflated price, hoping to find an even bigger fool who will buy it from you at a still higher price. Speculators who bought Beanie Babies and dot-com stocks at their peaks learned the expensive lesson that past price increases don’t guarantee future price increases.

## Intrinsic Value

For an investment, the crucial issue is not whether the supply is fixed or how much higher the price is today than yesterday, but whether the cash flow generated by the asset justifies the price. The initial outlay for a house is the downpayment and out-of-pocket closing costs. The subsequent cash flows are the rental savings, net of the mortgage payments, property taxes, and other expenses. If the house is sold at some future date, there is a terminal value cash flow equal to the sale proceeds net of the loan balance. We can calculate the net present value (NPV) for a given required return and also calculate the internal rate of return (IRR) that makes the NPV equal to zero. The IRR has the virtue of identifying a breakeven required return for which the investor is indifferent about the investment, but it also has several potential pitfalls, including the possibility of (a) an inverted NPV curve (with positive NPV for  $R > IRR$  and negative NPV for  $R < IRR$ ) if the cash flow is positive in the early years and negative in later years; or (b) multiple IRRs if there is more than one sign change in the cash flow. We can also determine the highest price one is willing to pay for a house, namely, the reservation price where the  $NPV = 0$ .

A free program for calculating the NPV is at: <http://www.economics.pomona.edu/GarySmith/ivyplanner>.

Consider a 3-bedroom, 2-bath, 2,000-square-foot house in Claremont, California. The price is \$400,000, with an \$80,000 downpayment. We assume that rents, housing prices, and most housing expenses grow by 4% a year. Although we used monthly data, Table 1 shows an annual summary for selected years.

Table 1 Claremont Spreadsheet

	Rent	Mortgage	Property	Tax	Other	Net Cash	Net Sales	Mortgage	NPV	IRR
Year	Savings	Payments	Taxes	Savings	Expenses	Flow	Price	Balance	R = 8%	(%)
1	24000	-23023	-4000	8083	-8520	-3460	382720	-316070	-21773	-22.8
2	24960	-23023	-4080	8026	-8861	-2978	398029	-311896	-12513	-0.2
3	25958	-23023	-4162	7964	-9215	-2477	413950	-307469	-4143	6.3
4	26997	-23023	-4245	7898	-9584	-1957	430508	-302767	3412	9.0
5	28077	-23023	-4330	7826	-9967	-1417	447728	-297774	10219	10.3
10	34159	-23023	-4780	7374	-12127	1604	544730	-267794	35035	11.4
15	41560	-23023	-5278	6726	-14754	5232	662747	-227356	48617	11.0
20	50564	-23023	-5827	5809	-17950	9573	806333	-172811	55033	10.5
25	61519	-23023	-6434	4526	-21839	14749	981028	-99239	56957	10.1
30	74848	-23023	-7103	2742	-26571	20893	1193570	0	56135	9.8

The net cash flow is negative for the first 7 years, but the homeowner is building up equity in an appreciating asset and the IRR is positive by the third year. In the current financial environment, few investments look so promising. If the buyer plans to sell the house after 10 years (and the price appreciates at the same 4% rate as rents over this period, the reservation prices at 6%, 8%, and 10% required returns are \$734,000, \$557,000, and \$451,000, respectively. If the buyer plans to stay in the house forever, the reservation prices rise to \$780,000, \$471,000, and \$364,000. The infinite horizon does not make any assumptions about future prices since it assumes the house won't ever be sold.

### Sensitivity Analysis

Investors should not be dismayed by the fact that they cannot provide exact values for the future cash flow. We don't need to know the values to the last penny. The way to handle imperfect knowledge is to try a range of values. More generally, it is a good idea to do a sensitivity analysis to see whether the NPV is reasonably robust or depends critically on certain key assumptions. For example, the effects of mortgage rates on NPVs are very strong because financial market conditions that increase interest rates also increase the prospective buyer's required rate of return. If, for example, the mortgage rate and required return both increase from 6% to 8% and then 10%, the NPV falls from \$62,246 to \$9,307 and then -\$34,444. The growth rate is also a crucial parameter here in that the purchase will not be financially rewarding unless there is some growth in rents and housing prices. The price is also important as there is surely some price at which a house is too expensive. At \$400,000, this house looks like a good investment if rents and prices increase at plausible rates; at \$800,000, the house loses a lot of its luster.

### The Palo Alto Bubble

Now consider a modest house in Palo Alto, California, that can be rented for \$3,000 a month and is

priced at \$2 million. We will increase the annual insurance cost to \$3500, but not change utilities and maintenance. Table 2 shows that the mortgage payments and property taxes swamp the rent savings, giving a negative annual cash flow of between \$60,000 and \$70,000 over the entire 30-year period.

Table 2 Palo Alto Spreadsheet

Year	Rent Savings	Mortgage Payments	Property Taxes	Tax Savings	Other Expenses	Net Cash Flow	Net Sales Price	Mortgage Balance	NPV R = 8%	IRR (%)
1	36000	-115114	-20000	40413	-11300	-70001	1913600	-1580352	-159348	-37.2
2	37440	-115114	-20400	40129	-11752	-69697	1990144	-1559492	-161533	-13.1
3	38938	-115114	-20808	39821	-12222	-69385	2069750	-1537345	-166237	-5.5
4	40495	-115114	-21224	39489	-12711	-69065	2152540	-1513833	-173170	-1.9
5	42115	-115114	-21649	39130	-13219	-68737	2238641	-1488870	-182069	0.1
10	51239	-115114	-23902	36871	-16083	-66989	2723649	-1338972	-248399	3.5
15	62340	-115114	-26390	33630	-19568	-65101	3313736	-1136782	-355983	4.3
20	75847	-115114	-29136	29046	-23807	-63165	4031667	-864057	-430881	4.5
25	92279	-115114	-32169	22628	-28965	-61341	4905139	-496193	-524958	4.6
30	112271	-115114	-35517	13710	-35241	-59890	5967851	0	-613748	4.7

The only rainbow is the assumption that the price will rise by 4% a year, giving a substantial capital gain when the house is sold. Even so, the IRR is never higher than 5% and the NPV at an 8% required return is always negative. If the buyer plans to sell the house after 10 years (and the price appreciates at the same 4% rate as rents over this period, the reservation prices at 6%, 8%, and 10% required returns are \$1,171,000, \$888,000, and \$719,000, respectively. If the price only rises by 3% a year, the reservation prices are \$855,000, \$709,000, and \$608,000. If the buyer plans to stay in the house forever (so that future price increases are irrelevant), the reservation prices are \$1,245,000, \$751,000, and \$580,000. The \$2 million market price may be justified if the homebuyer is willing to settle for a modest rate of return. Otherwise, it looks like a bubble fueled by expectations that prices will continue to rise rapidly.

## Conclusions

For any investment, the crucial question is whether the cash flow generated by the asset justifies the price. The cash flow from residential real estate is the rental payments the owner would otherwise have to pay to live in the home, net of the various expenses associated with home ownership. The calculations are complicated by the reality that houses are financed with mortgages and this leverage matters if the mortgage rate is not equal to the buyer's required rate of return. In addition, the cash flow from the rental savings grow indefinitely, while mortgage payments are stable with a finite life and the tax-deductible portion of the mortgage payment declines over time. Nonetheless, we can use a spreadsheet to handle this complexity and the gains in analytical power are well worth the effort. Augmented by a sensitivity analysis, such a model enables us to compare intrinsic values with market prices and thereby assess whether houses in a particular real estate market are overpriced or are bargains.